

*Control Function Unit  
3-7-65*

**SATURN S-IVB STAGE WEIGHT  
AND BALANCE STATUS REPORT  
MODEL NO. DSV-4B**  
101

15 APRIL 1964  
DOUGLAS REPORT 5M-46626

**MISSILE & SPACE SYSTEMS DIVISION  
DOUGLAS AIRCRAFT COMPANY, INC.  
SANTA MONICA/CALIFORNIA**

FACILITY FORM 602

<u>N70-76219</u> (ACCESSION NUMBER)	_____ (THRU)
<u>38</u> (PAGES)	<u>none</u> (CODE)
<u>CR-113333</u> (NASA CR OR TMX OR AD NUMBER)	_____ (CATEGORY)



**SATURN S-IVB STAGE WEIGHT  
AND BALANCE STATUS REPORT  
MODEL NO. DSV-4B**

(u)

**15 APRIL 1964  
DOUGLAS REPORT SM-46626**

PREPARED BY: W.E. KRUSE  
WEIGHT CONTROL SECTION  
SATURN ENGINEERING

PREPARED FOR:  
NATIONAL AERONAUTICS AND  
SPACE ADMINISTRATION  
UNDER CONTRACT NO. NAS 7-101



APPROVED BY: T. SIMKO  
CHIEF, WEIGHT CONTROL SECTION

ABSTRACT

This contractually required report up-dates the weight and balance status of the Saturn S-IVB Stage from that shown in the previous report, SM-46624, dated 15 March 1964.

The weight tables and explanations of changes, which are presented in semi-detailed form (MSFC-STD-204A Second Generation Level of Detail) show that the S-V/S-IVB and S-IB/S-IVB dry weights have increased 42 and 125 pounds, respectively, as compared with the previous report.

TABLE OF CONTENTS

<u>Section</u>	<u>Page</u>
Abstract . . . . .	
1.0 Summary . . . . .	
2.0 Status Report - Saturn V/S-IVB. . . . .	
3.0 Status Report - Saturn IB/S-IVB . . . . .	
Appendix I	
Authorized Scope Changes Incorporated into the Saturn S-IVB Weight and Balance Status Report. . . . .	
Appendix II	
Authorized Changes Not Incorporated into the Body of the Weight and Balance Status Report. . . . .	
Appendix III	
Pending Changes to Specification Weight . . . . .	

## 1.0 SUMMARY

The following pages constitute the eleventh (15 April 1964) Weight and Balance Status Report for the Saturn S-IVB Stages reflecting those changes since the Weight and Balance Status Report, SM-46624, dated 15 March 1964.

The Saturn V/S-IVB dry weight change between the last and the current status reports is an increase of 42 pounds, consisting primarily of the incorporation of a weight allowance for module mounted panels on the thrust structure and production drawing changes based upon current design criteria.

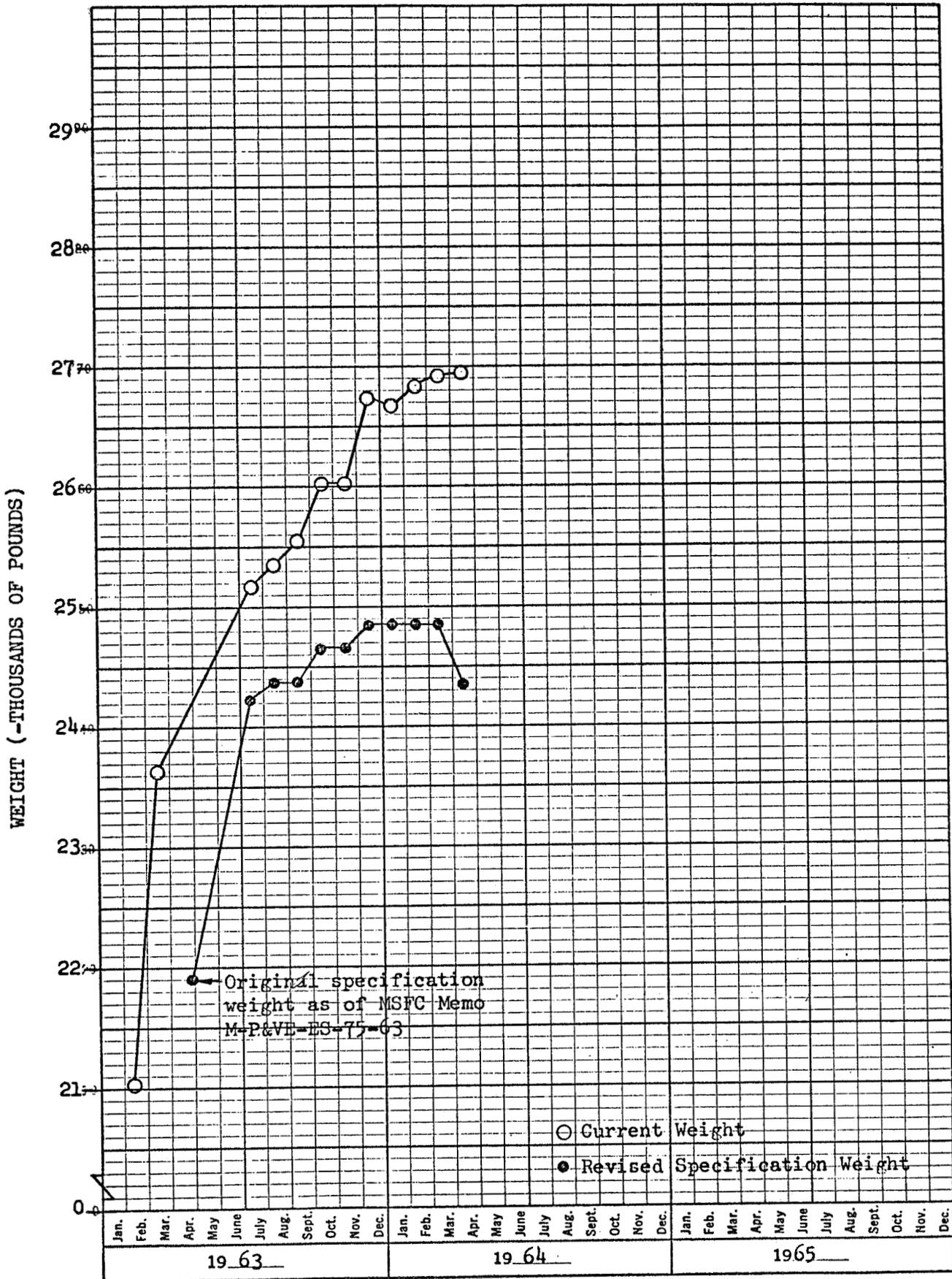
The Saturn IB/S-IVB dry weight change between the last and the current status reports is an increase of 125 pounds, consisting primarily of the incorporation of weight allowances for module mounted panels on the thrust structure and Ullage Rocket Jettison controls, plus production drawing changes based upon current design criteria.

As a result of a request (MSFC letter I-V-S-IVB-64-A9 dated March 17, 1964) from Mr. Roy E. Godfrey, S-IVB Stage Manager, Appendices II and III are being added to this report. Appendix II presents a listing of authorized changes, and their respective effects on current weight, to the current status not incorporated into the body of the weight and balance status report at this time. Appendix III presents a listing of ROM (Rough Order of Magnitude) effects of pending changes to the specification weight.

Also, two graphs have been added to the Summary of the report which reflect documented stage dry weight as a function of time.

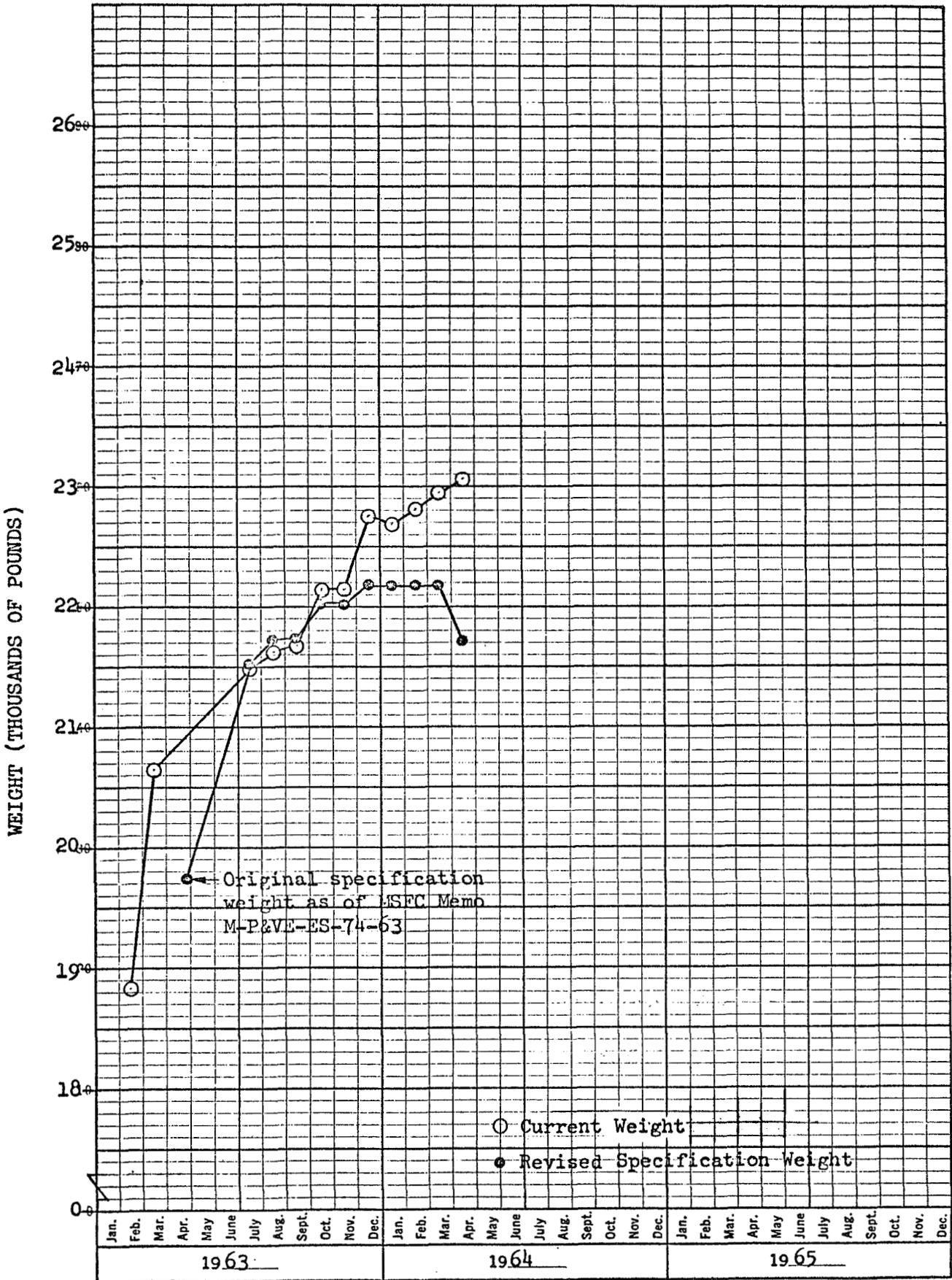
This report reflects only those items of the S-IVB Stage which are, or are to be fabricated or installed per Douglas Aircraft Company drawings.

SATURN V/S-IVB DOCUMENTED STAGE DRY WEIGHT HISTORY



YEAR MONTH 359  
X 100 DIVISIONS  
KEUFFEL & ESSER CO. MADE IN U.S.A.

SATURN IB/S-IVB DOCUMENTED STAGE DRY WEIGHT HISTORY



3 YEARS BY MONTHS 359-120  
 KEUFFEL & ESSER CO. MADE IN U.S.A.

## 2.0 STATUS REPORT - SATURN V/S-IVB

The data given in this section reflects both the specification weight and the current weight of the Saturn S-IVB Stage for the Saturn V configuration, and are organized functionally (including alpha-numeric notation) in accordance with MSFC-STD-204A.

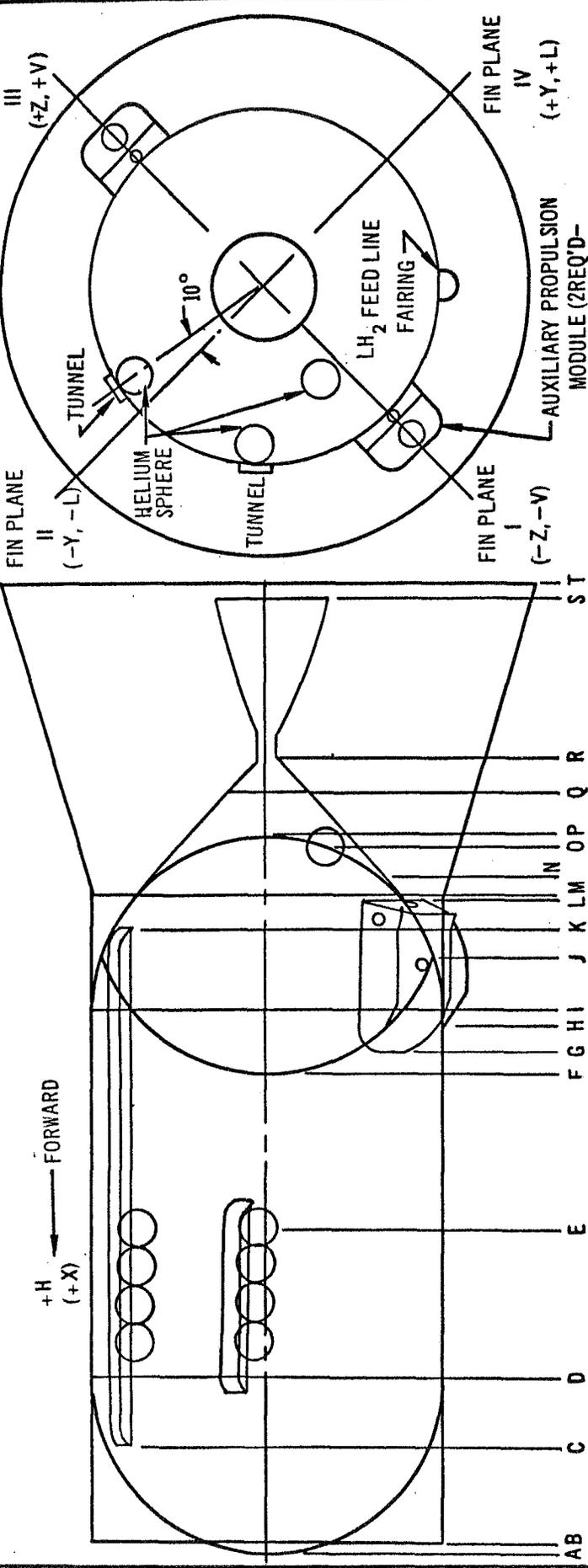
MODEL Saturn V/S-IVB	CONTRACT NUMBER NAS7-101	DATE 4-15-64	ISSUE No. 11	MISSION	ORIGINAL Spec. WEIGHT AS OF MSFC Memo M-P&VE-ES -75-63 dated 4-29-63	TOTAL MSFC RESPON- SIBILITY & GFE CHANGES	REVISED Spec. WEIGHT	TOTAL CON- TRACTOR RESPON- SIBILITY CHANGES Over or Under	LAST STATUS SM-46624 DATED 3-15-64 ISSUE No. 10	CHANGE BETWEEN LAST & CURRENT STATUS REPORTS		CURRENT STATUS	CURRENT WEIGHT/ REVISED Spec. WEIGHT RATIO	CURRENT AVERAGE WEIGHT CLASS
										MSFC RESPON- SIBILITY & GFE CHANGES	CON- TRACTOR RESPON- SIBILITY CHANGES			
Structure		W3.0			(12,762)	(+676)	(13,438)	(+788)	(14,215)	(-185)	(+196)	(14,226)	(1.059)	(4.7)
Propellant Container		3.3			9,454	+631	10,085	-214	9,871	---	---	9,871	0.979	4.7
Forward of Tanks		3.6			1,165	---	1,165	+43	1,194	---	+14	1,208	1.037	5.0
Aft of Tanks		3.8			1,310	---	1,310	+682	1,995	---	-3	1,992	1.521	4.1
Thrust Structure		3.9			508	+30	538	+227	765	-185	+185	765	1.422	5.1
Fairings & Assoc. Structure		3.10			259	+15	274	-113	161	---	---	161	0.588	4.0
Paint & Sealer		3.15			66	---	66	+52	118	---	---	118	1.788	4.0
Ablative Insul-Thermolag		3.18			0	---	---	+111	111	---	---	111	---	4.0
Propulsion Sys. & Accessories		W4.0			(5,636)	(+1,086)	(6,722)	(+162)	(6,878)	(---	(+6)	(6,884)	(1.024)	(4.5)
Engine & Accessories		4.1			3,343	+124	3,467	+110	3,571	---	+6	3,577	1.032	4.0
Purge System for Chilldown		4.6			61	+123	184	+14	197	---	+1	198	1.076	4.6
Fuel System		4.7			1,362	+422	1,784	-16	1,773	---	-5	1,768	0.991	5.1
Oxidizer System		4.8			667	+387	1,054	+32	1,082	---	+4	1,086	1.030	4.9
Stage Control Sys. Hardware		4.10			203	+30	233	+22	255	---	---	255	1.094	4.2
Equipment & Instrumentation		W6.0			(3,502)	(+708)	(4,210)	(+1,635)	(5,820)	(-295)	(+320)	(5,845)	(1.388)	(4.2)
Structure (Equip. & Instr.)		6.1			0	+54	54	+316	358	---	+12	370	6.852	4.7
Environmental Control System		6.2			200	+104	304	-205	127	---	-28	99	0.326	4.1
Control System Electronics		6.5			250	---	250	-211	39	---	---	39	0.156	4.0
Telemetry & Measuring Equip.		6.8			1,000	+660	1,660	+449	2,068	-295	+336	2,109	1.270	4.1
Propellant Utilization Sys.		6.10			186	---	186	+29	215	---	---	215	1.156	4.1
Electrical System		6.11			492	---	492	+350	842	---	---	842	1.711	4.0
Range Safety Equipment		6.12			90	---	90	-9	81	---	---	81	0.900	4.0

MODEL Saturn V/S-IVB	CONTRACT NUMBER NAS7-101	DATE 4-15-64	ISSUE No. 11	MISSION	ORIGINAL Spec. WEIGHT AS OF MSFC Memo M-P&VE-ES -75-63 dated 4-29-64	TOTAL MSFC RESPON- SIBILITY & GFE CHANGES	REVISED Spec. WEIGHT	TOTAL CON- TRACTOR RESPON- SIBILITY CHANGES  Over or Under	LAST STATUS DATED SM-46624 3-15-64 ISSUE No. 10	CHANGE BETWEEN LAST & CURRENT STATUS REPORTS		CURRENT STATUS	CURRENT WEIGHT/ REVISED Spec. WEIGHT RATIO	CURRENT AVERAGE WEIGHT CLASS  ACT 6.0 CAL 5.0 EST 4.0
										MSFC RESPON- SIBILITY & GFE CHANGES	CON- TRACTOR RESPON- SIBILITY CHANGES			
Pneumatic System		W6.15			43	---	43	+3	46	---	---	46	1.070	4.0
Auxiliary Propulsion System		6.16			900	---	900	+939	1,839	---	---	1,839	2.043	4.3
Separation System		6.17			200	-110	90	-10	80	---	---	80	0.889	4.2
Systems for Total Vehicle		6.20			141	---	141	-16	125	---	---	125	0.887	4.0
Stage Dry Weight		Wad			(21,900)	(+2,470)	(24,370)	(+2,585)	(26,913)	(-480)	(+522)	(26,955)	(1.106)	(4.5)
Residual & Reserve Propellants and Service Items (2nd Burn)		W7.0			(2,978)	(+135)	(3,113)	(-57)	(3,056)	(---	(---	(3,056)		
Fuel Tank Pressurization & Resid. Gases (CH <sub>2</sub> + He)		7.1			396	+62	458	+408	866	---	---	866		
Fuel - Mixture Ratio Shift		7.2			249	---	249	-124	125	---	---	125		
Fuel - Thrust Decay		7.3			25	---	25	---	25	---	---	25		
Fuel - Trapped		7.4			507	---	507	-6	501	---	---	501		
Oxidizer Tank Pressurization & Residual Gases (GO <sub>2</sub> + He)		7.5			252	+193	445	+9	454	---	---	454		
Oxidizer-Mixture Ratio Shift		7.6			901	---	901	-451	450	---	---	450		
Oxidizer - Thrust Decay		7.7			75	---	75	---	75	---	---	75		
Oxidizer - Trapped		7.8			440	---	440	+19	459	---	---	459		
Service Items		7.9			133	-120	13	+88	101	---	---	101		
Standard Propellant & Service Item Consumption (2nd Burn)		W8.0			(150,431)	(---	(150,431)	(-958)	(149,473)	(---	(---	(149,473)		
Fuel		8.1			25,067	---	25,067	-159	24,908	---	---	24,908		
Oxidizer		8.2			125,334	---	125,334	-794	124,540	---	---	124,540		
Service Items (Roll Control)		8.4			30	---	30	-5	25	---	---	25		

MODEL <u>Saturn V/S-IVB</u> CONTRACT NUMBER <u>NAS7-101</u> DATE <u>4-15-64</u> ISSUE <u>No. 11</u> MISSION _____	ORIGINAL Spec. WEIGHT AS OF MSFC Memo M-P&VE-ES -75-63 dated 4-29-63	TOTAL MSFC RESPON- SIBILITY & GFE CHANGES	REVISED Spec. WEIGHT	TOTAL CON- TRACTOR RESPON- SIBILITY CHANGES Over or Under	LAST STATUS DATED SM-46624 3-15-64 ISSUE No. 10	CHANGE BETWEEN LAST & CURRENT STATUS REPORTS		CURRENT STATUS	CURRENT WEIGHT/ REVISED Spec. WEIGHT RATIO	CURRENT AVERAGE WEIGHT CLASS ACT 6.0 CAL 5.0 EST 4.0
						MSFC RESPON- SIBILITY & GFE CHANGES	CON- TRACTOR RESPON- SIBILITY CHANGES			
Other Weight Items (2nd Burn) W9.0	(5,974)	(---	(5,974)	(-780)	(5,194)	(---	(---	(5,194)		
Fuel - Thrust Buildup 9.1	165	---	165	---	165	---	---	165		
Oxidizer - Thrust Buildup 9.2	320	---	320	---	320	---	---	320		
Fuel - Vented 9.4	4,000	---	4,000	-600	3,400	---	---	3,400		
Service Items (Attitude Control Vent Cycle, Chilldown, Ullage) 9.6	1,489	---	1,489	-180	1,309	---	---	1,309		
Residual & Reserve Propellants and Service Items (1st Burn) W7.0	(100)	(---	(100)	(---	(100)	(---	(---	(100)		
Fuel - Thrust Decay 7.3	25	---	25	---	25	---	---	25		
Oxidizer - Thrust Decay 7.7	75	---	75	---	75	---	---	75		
Standard Propellant & Service Item Consumption (1st Burn) W8.0	(79,615)	(---	(79,615)	(+951)	(80,566)	(---	(---	(80,566)		
Fuel 8.1	13,267	---	13,267	+158	13,425	---	---	13,425		
Oxidizer 8.2	66,332	---	66,332	+795	67,127	---	---	67,127		
Service Items (Roll Control) 8.4	16	---	16	-2	14	---	---	14		
Other Weight Items (1st Burn) W9.0	(583)	(---	(583)	(-34)	(549)	(---	(---	(549)		
Fuel - Thrust Buildup 9.1	165	---	165	---	165	---	---	165		
Oxidizer - Thrust Buildup 9.2	320	---	320	---	320	---	---	320		
Service Items (Ullage) 9.6	98	---	98	-34	64	---	---	64		
S-IVB Stage at Ground Ignition WAg	(261,581)	(+2,605)	(264,186)	(+1,707)	(265,851)	(-480)	(+522)	(265,893)		

MODEL Saturn V/S-IVB	CONTRACT NUMBER NAS7-101	DATE 4-15-64	ISSUE No. 11	MISSION	ORIGINAL Spec. WEIGHT AS OF MSFC Memo M-P&VE-ES -75-63 dated 4-29-63	TOTAL MSFC RESPON- SIBILITY & GFE CHANGES	REVISED Spec. WEIGHT	TOTAL CON- TRACTOR RESPON- SIBILITY CHANGES Over or Under	LAST STATUS DATED 3-15-64 ISSUE No. 10	CHANGE BETWEEN LAST & CURRENT STATUS REPORTS		CURRENT STATUS	CURRENT WEIGHT/ REVISED Spec. WEIGHT RATIO	CURRENT AVERAGE WEIGHT CLASS ACT 6.0 CAL 5.0 EST 4.0
										MSFC RESPON- SIBILITY & GFE CHANGES	CON- TRACTOR RESPON- SIBILITY CHANGES			
Structure		W3.0			(5,566)	(---	(5,566)	(+44)	(5,613)	(---	(-3)	(5,610)	(1.008)	(5.0)
Interstage		3.13			5,566	---	5,566	-36	5,533	---	-3	5,530	0.994	5.0
Paint & Sealer		3.15			0	---	---	+80	80	---	---	80	---	4.0
Equipment & Instrumentation		W6.0			(780)	(---	(780)	(-72)	(711)	(---	(-3)	(708)	(0.908)	(4.3)
Environmental Control System		6.2			0	---	---	+9	9	---	---	9	---	5.0
Separation System		6.17			780	---	780	-81	702	---	-3	699	0.896	4.3
Dry S-II/S-IVB Interstage		Wbd			(6,346)	(---	(6,346)	(-28)	(6,324)	(---	(-6)	(6,318)	(0.996)	(4.9)
Residual and Reserve Propellants and Service Items		W7.0			(1,080)	(---	(1,080)	(-12)	(1,068)	(---	(---	(1,068)		
Service Items (Retro)		7.9			1,080	---	1,080	-12	1,068	---	---	1,068		
S-II/S-IVB Interstage at Ground Ignition		Wbg			(7,426)	(---	(7,426)	(-40)	(7,392)	(---	(-6)	(7,386)		

SATURN V /S-IVB INSTALLATION - STATION LIST



INSTALLATION	STATION	INSTALLATION	STATION
A. FWD. BULKHEAD (FWD. END)	684.6	I. AFT SKIRT (FWD. END)	286.1
B. FWD. SKIRT (FWD. END)	676.7	J. COMMON BULKHEAD (AFT END)	244.9
C. TUNNEL (FWD. END)	607.7	K. TUNNEL (AFT END)	224.1
D. FWD. SKIRT (AFT. END)	554.7	L. AUXILIARY PROPULSION MODULE (AFT END)	203.7
E. SIDEWALL (FWD. END)	554.7	M. LH <sub>2</sub> FEED LINE FAIRING (AFT END)	202.7
F. FWD. BULKHEAD (AFT END)	553.0	N. AFT SKIRT (AFT END)	200.6
G. COLD HELIUM BOTTLES	454.0	O. INTERSTAGE (FWD END)	186.7
H. 8 BOTTLES @ 26.9" ON CENTERS	335.2	P. TANGENT POINT THRUST STRUCTURE	166.8
I. COMMON BULKHEAD (FWD. END)	315.2	Q. AMBIENT HELIUM SPHERES	156.3
J. AUXILIARY PROPULSION MODULE (FWD. END)	295.1	R. 10 SPHERES @ 22.5" ON CENTERS	124.6
K. LH <sub>2</sub> FEED LINE FAIRING (FWD. END)	286.1	S. AFT BULKHEAD (AFT)	100.0
L. SIDEWALL (AFT END)	287.9	T. THRUST STRUCTURE (AFT END)	-16.0
M. AFT BULKHEAD (FWD. END)		U. GIMBAL STATION	-26.9
N. AFT BULKHEAD (AFT END)		V. ENGINE NOZZLE (AFT END)	
O. INTERSTAGE (AFT END)		W. INTERSTAGE (AFT END)	

FLIGHT SEQUENCING

Moment of Inertia  
(Kg-M-Sec<sup>2</sup>)

Center of Gravity  
(DAC Station - Inches)

Pitch Roll

X Y Z

Weight  
(Pounds)

Saturn V/S-IVB

	Weight (Pounds)	X	Y	Z	Pitch	Roll
S-IVB Stage at Ground Ignition	265,893	285.1	-0.7	-0.1	100,600	9,820
Service Items (Ullage)	-64					
Aft Frame - Jettison	-25					
Wag						
W9.6						
W3.8						
S-IVB Stage at First Ignition	265,804	285.1	-0.7	-0.1	100,500	9,770
Fuel - Thrust Buildup	-165					
Oxidizer - Thrust Buildup	-320					
Wai						
W9.1						
9.2						
S-IVB Stage at First Liftoff	265,319	284.8	-0.7	-0.1	99,900	9,770
Fuel	-13,425					
Oxidizer	-67,127					
Service Items (Roll Control)	-14					
Wal						
W8.1						
8.2						
8.4						
S-IVB Stage at First Cutoff	184,753	265.7	-1.0	-0.1	64,300	9,720
Fuel - Thrust Decay	-25					
Oxidizer - Thrust Decay	-75					
Wac						
W7.3						
7.7						
S-IVB Stage at End of First Thrst. Decay	184,653	265.6	-1.0	-0.1	64,200	9,720
Fuel - Vented	-3,400					
Service Items (Attitude Control Vent Cycle, Ullage)	-1,309					
Was						
W9.4						
9.6						
S-IVB Stage at Second Ignition	179,944	261.3	-1.1	-0.1	57,500	8,870
Fuel - Thrust Buildup	-165					
Oxidizer - Thrust Buildup	-320					
Wai						
W9.1						
9.2						
S-IVB Stage at Second Liftoff	179,459	261.1	-1.1	-0.1	57,200	8,870
Fuel	-24,908					
Oxidizer	-124,540					
Service Items (Roll Control)	-25					
Wal						
W8.1						
8.2						
8.4						
S-IVB Stage at Second Cutoff	29,986	315.1	-4.7	-1.0	32,400	8,930
Fuel - Thrust Decay	-25					
Oxidizer - Thrust Decay	-75					
Wac						
W7.3						
7.7						
S-IVB Stage at End of Second Thrust Decay	29,886	315.6	-4.7	-1.0	32,300	8,930
Was						
S-IVB Stage Dry Weight	26,955	319.4	-5.3	-1.1	30,400	8,850
Wad						

FLIGHT SEQUENCING

Saturn V/S-IVB	Weight (Pounds)	Center of Gravity (DAC Station - Inches)			Moment of Inertia (Kg-M-Sec <sup>2</sup> )	
		X	Y	Z	Pitch	Roll
S-II/S-IVB Interstage at Ground Ignition	7,386	70.4	-3.2	-0.9	3,870	6,110
Service Items (Retro)	1,068					
S-II/S-IVB Interstage at End of Thrust Decay	6,318	79.0	-3.8	-1.1	3,310	5,170

ITEM	CHANGE BETWEEN LAST & CURRENT STATUS REPORTS	REASONS FOR DIFFERENCES	MSFC RESPONSIBILITY CHANGES (Saturn V/S-IVB)
Structure W3.0 Thrust Structure 3.9	(-185) -185	As a result of a request from Mr. Roy E. Godfrey, S-IVB Stage Manager, (Reference: letter number I-V-S-IVB-64-A9, dated March 17, 1964) the estimated weight effect of unapproved Scope Change 1071, Redesign of Thrust Structure (+185 pounds added per SM-44177, dated August 15, 1963), is allocated to "Contractor Responsibility Changes" (-185 pounds). At such time as the scope change becomes contractual the weight effect will be reallocated to "MSFC Responsibility Changes".	
Equipment & Instrumentation W6.0 Telemetry & Measuring Equip. 6.8	(-295) -295	Allocation of estimated weight effect of unapproved Scope Change 1033A, Leak Detection (+295 pounds added per SM-44763, dated October 15, 1963), to "Contractor Responsibility Changes" for the reason as stated in 3.9 above (-295 pounds).	

ITEM	CHANGE BETWEEN LAST & CURRENT STATUS REPORTS	REASONS FOR DIFFERENCES	<u>CONTRACTOR RESPONSIBILITY CHANGES</u> (Saturn V/S-IVB)
Structure	W3.0 (+196)		
Forward of Tanks	3.6 +14	The forward skirt skin weight is revised to reflect the incorporation of a splice and doublers required for ease of manufacture (+9 pounds).	
Aft of Tanks	3.8 -3	The miscellaneous changes to the forward skirt are due to a redesign of intercostals based upon current acoustic design criteria. This results in a weight increase (+5 pounds).	
Thrust Structure	3.9 +185	Incorporation of first release production drawings on the umbilical panel installation in the aft skirt results in a weight decrease (-3 pounds).	
Propulsion Sys. & Accessories	W4.0 (+6)	Allocation of estimated weight effect of unapproved Scope Change 1071, Redesign of Thrust Structure, from "MSFC Responsibility Changes" (+185 pounds). See Thrust Structure - "MSFC Responsibility Changes".	
Engine & Accessories	4.1 +6	The weight for engine controls is revised to reflect an increase in tube lengths due to minor rerouting from the customer connect panel to the umbilical (+2 pounds) and a correction on the calculation for flex hoses used in tube assemblies (+4 pounds).	
Purge System for Chilldown	4.6 +1	Miscellaneous weight changes (+1 pound).	
Fuel System	4.7 -5	The pressurization system is revised to reflect a vendor actual weight for pressure switches (-4 pounds).	
Oxidizer System	4.8 +4	Miscellaneous weight changes (-1 pound). The tank pressurization system is revised to reflect miscellaneous production drawing changes (+8 pounds) and a vendor actual weight for pressure switches (-4 pounds).	

ITEM	CHANGE BETWEEN LAST & CURRENT STATUS REPORTS	REASONS FOR DIFFERENCES	CONTRACTOR RESPONSIBILITY CHANGES (Saturn V/S-IVB)
Equipment & Instrumentation W6.0	(+320)		The secondary structure in the forward skirt is revised to include changes from estimates to calculations for a redesign of intercostals, based upon current acoustic design criteria, as reflected in production drawing changes (-13 pounds).
Structure (Equip. & Instr.) 6.1	+12		An allowance is added for module mounting panels on the thrust structure (+25 pounds).
Environmental Control Sys. 6.2	-28		Reallocation of panel attachments and accessories to Telemetry & Measuring Equip., W6.8, in accordance with the functional organization of MSFC-STD-204A (-28 pounds).
Telemetry & Measuring Equip. 6.8	+336		Reallocation of panel attachments and accessories from Environmental Control System, W6.2, in accordance with the functional organization of MSFC-STD-204A (+28 pounds).
			Incorporation of weight estimate revisions for the bus modules and the temperature bridge modules based upon first release production drawings on the S-IVB All Systems Vehicle (+13 pounds).
			Allocation of estimated weight effect of unapproved Scope Change 1033A, Leak Detection, from "MSFC Responsibility Changes" (+295 pounds). See Thrust Structure - "MSFC Responsibility Changes".
<u>S-II/S-IVB Interstage</u>			
Structure W3.0	(-3)		
Interstage 3.13	-3		The frame weight is revised to reflect a replacement of Lock Bolts by Rivets to standardize assembly and the extra strength of Lock Bolts is not needed (-2 pounds).  Miscellaneous weight changes (-1 pound).

ITEM	CHANGE BETWEEN LAST & CURRENT STATUS REPORTS	REASONS FOR DIFFERENCES	<u>CONTRACTOR RESPONSIBILITY CHANGES</u> (Saturn V/S-IVB)
Equipment and Instrumentation W6.0	(-3)		
Separation System 6.17	-3	<p>The allowance for upper retro rocket support fittings is deleted as this weight is carried on a production drawing previously incorporated into the status (-21 pounds).</p> <p>The Separation System is revised to reflect changes from estimates to first release production drawings on the Retro Rocket Instrument Kit (+6 pounds), the Retro Rocket Fixed Fairing (+13 pounds) and on the Retro Rocket Jettisonable Fairings (-1 pound).</p>	

### 3.0 STATUS REPORT - SATURN IB/S-IVB

The data given in this section reflects both the specification weight and the current weight of the Saturn S-IVB Stage for the Saturn IB configuration, and are organized functionally (including alpha-numeric notation) in accordance with MSFC-STD-204A.

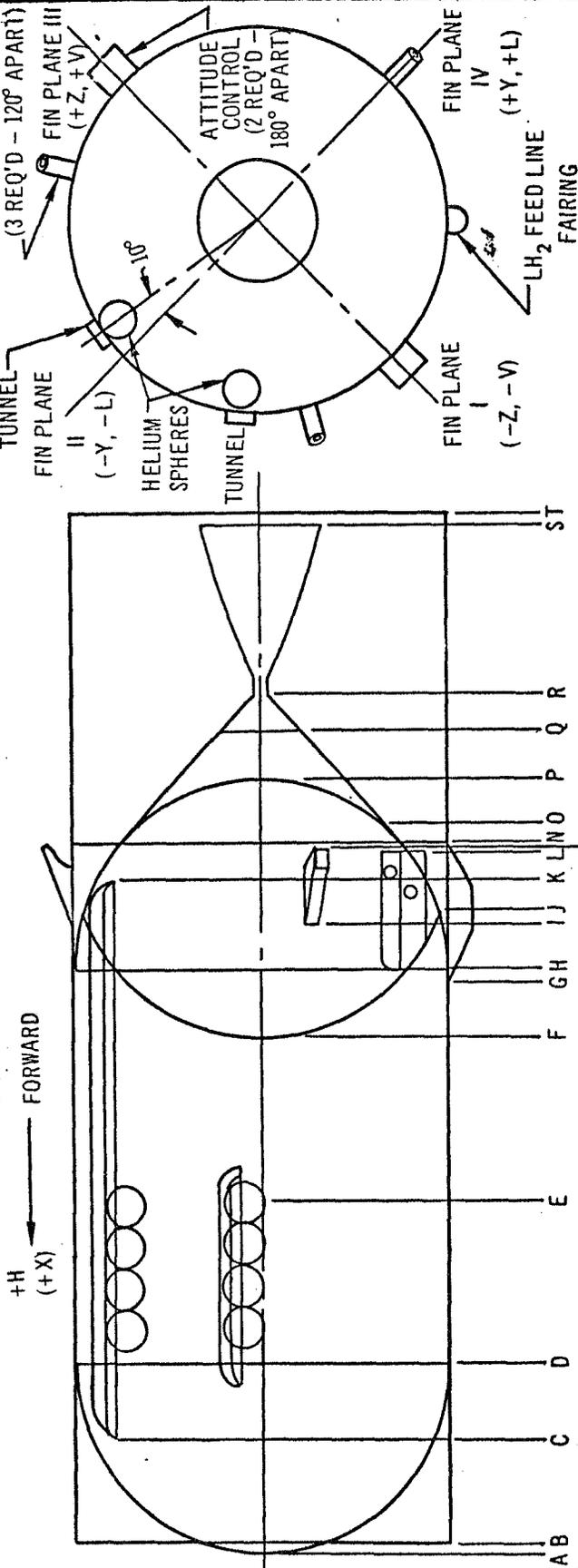
MODEL CONTRACT NUMBER DATE MISSION	Saturn IB/S-IVB NAS7-101 4-15-64 ISSUE No. 11	ORIGINAL Spec. WEIGHT AS OF MSFC Memo M-P&VE-ES -74-63 dated 4-29-63	TOTAL MSFC RESPON- SIBILITY & GFE CHANGES	REVISED Spec. WEIGHT	TOTAL CON- TRACTOR RESPON- SIBILITY CHANGES Over or Under	LAST STATUS SM-46624 DATED 3-15-64 ISSUE No. 10	CHANGE BETWEEN LAST & CURRENT STATUS REPORTS		CURRENT STATUS	CURRENT WEIGHT/ REVISED Spec. WEIGHT RATIO	CURRENT AVERAGE WEIGHT CLASS ACT 6.0 CAL 5.0 EST 4.0
							MSFC RESPON- SIBILITY & GFE CHANGES	CON- TRACTOR RESPON- SIBILITY CHANGES			
Structure	W3.0	(12,193)	(+676)	(12,869)	(+407)	(13,241)	(-185)	(+220)	(13,276)	(1.032)	(4.8)
Propellant Container	3.3	9,294	+631	9,925	-143	9,782	---	---	9,782	0.986	4.7
Forward of Tanks	3.6	1,056	---	1,056	-28	1,028	---	---	1,028	0.973	5.0
Aft of Tanks	3.8	1,056	---	1,056	+308	1,329	---	+35	1,364	1.292	5.0
Thrust Structure	3.9	508	+30	538	+227	765	-185	+185	765	1.422	5.0
Fairings & Assoc. Structure	3.10	213	+15	228	-67	161	---	---	161	0.706	4.0
Paint & Sealer	3.15	66	---	66	+52	118	---	---	118	1.788	4.0
Ablative Insul-Thermolag	3.18	0	---	---	+58	58	---	---	58	---	4.0
Propulsion Sys. & Accessories	W4.0	(4,781)	(+536)	(5,317)	(+0)	(5,311)	(---	(+6)	(5,317)	(1.000)	(4.2)
Engine & Accessories	4.1	3,343	+124	3,467	+110	3,571	---	+6	3,577	1.032	4.0
Purge System for Chilldown	4.6	61	+123	184	+14	197	---	+1	198	1.076	4.6
Fuel System	4.7	507	+10	517	-31	489	---	-3	486	0.940	4.1
Oxidizer System	4.8	667	+249	916	-115	799	---	+2	801	0.874	4.7
Stage Control Sys. Hardware	4.10	203	+30	233	+22	255	---	---	255	1.094	4.2
Equipment & Instrumentation	W6.0	(2,776)	(+753)	(3,529)	(+949)	(4,394)	(-295)	(+379)	(4,478)	(1.269)	(4.2)
Structure (Equip. & Instr.)	6.1	0	+54	54	+259	286	---	+27	313	5.796	4.8
Environmental Control Sys.	6.2	200	+104	304	-202	130	---	-28	102	0.336	4.1
Control System Electronics	6.5	250	---	250	-211	39	---	---	39	0.156	4.0
Telemetry & Measuring Equip.	6.8	975	+665	1,640	+434	2,034	-295	+335	2,074	1.265	4.1
Propellant Utilization System	6.10	186	---	186	+29	215	---	---	215	1.156	4.1
Electrical System	6.11	150	---	150	+280	420	---	+10	430	2.867	4.0
Range Safety Equipment	6.12	90	---	90	-9	81	---	---	81	0.900	4.0



MODEL <u>Saturn IB/S-IVB</u> CONTRACT NUMBER <u>NAS7-101</u> DATE <u>4-15-64</u> ISSUE <u>No. 11</u> MISSION _____	ORIGINAL Spec. WEIGHT AS OF MSFC Memo M-F&VE-ES <u>-74-63</u> <u>4-29-63</u>	TOTAL MSFC RESPON- SIBILITY & GFE CHANGES	REVISED Spec. WEIGHT	TOTAL CON- TRACTOR RESPON- SIBILITY CHANGES Over or Under	LAST STATUS SM-46624 DATED 3-15-64 ISSUE No. 10	CHANGE BETWEEN LAST & CURRENT STATUS REPORTS		CURRENT STATUS	CURRENT WEIGHT/ REVISED Spec. WEIGHT RATIO	CURRENT AVERAGE WEIGHT CLASS ACT 6.0 CAL 5.0 EST 4.0
						MSFC RESPON- SIBILITY & GFE CHANGES	CON- TRACTOR RESPON- SIBILITY CHANGES			
Service Items (Roll Control) W8.4	40	---	40	+80	120	---	---	120		
Other Weight Items W9.0	(667)	(---)	(667)	(+1)	(668)	(---)	(---)	(668)		
Fuel - Thrust Buildup 9.1	165	---	165	---	165	---	---	165		
Oxidizer - Thrust Buildup 9.2	320	---	320	---	320	---	---	320		
Service Items (Ullage) 9.6	182	---	182	+1	183	---	---	183		
S-IVB Stage at Ground Ignition Wag	(243,205)	(+2,114)	(245,319)	(+402)	(245,596)	(-480)	(+605)	(245,721)		

MODEL Saturn IB/S-IVB	CONTRACT NUMBER NAS7-101	DATE 4-15-64	ISSUE No. 11	MISSION	ORIGINAL Spec. WEIGHT AS OF MSFC Memo M-P&VE-ES -74-63 dated 4-29-63	TOTAL MSFC RESPON- SIBILITY & GFE CHANGES	REVISED Spec. WEIGHT	TOTAL CON- TRACTOR RESPON- SIBILITY CHANGES Over or Under	LAST STATUS SM-46624 DATED 3-15-64 ISSUE No. 10	CHANGE BETWEEN LAST & CURRENT STATUS REPORTS		CURRENT STATUS	CURRENT WEIGHT/ REVISED Spec. WEIGHT RATIO	CURRENT AVERAGE WEIGHT CLASS ACT 6.0 CAL 5.0 EST 4.0
										MSFC RESPON- SIBILITY & GFE CHANGES	CON- TRACTOR RESPON- SIBILITY CHANGES			
Structure		W3.0			(3,620)	(+460)	(4,080)	(-213)	(3,836)	(---)	(+31)	(3,867)	(0.948)	(5.2)
Interstage		3.13			3,620	+460	4,080	-284	3,765	---	+31	3,796	0.930	5.3
Paint & Sealer		3.15			0	---	---	+43	43	---	---	43	---	4.0
Ablative Insul-Thermolag		3.18			0	---	---	+28	28	---	---	28	---	4.0
Equipment & Instrumentation		W6.0			(900)	(+16)	(916)	(+74)	(990)	(---)	(---)	(990)	(1.081)	(4.0)
Separation System		6.17			900	+16	916	+74	990	---	---	990	1.081	4.0
Dry S-IB/S-IVB Interstage		Wdb			(4,520)	(+476)	(4,996)	(-139)	(4,826)	(---)	(+31)	(4,857)	(0.972)	(5.0)
Residual and Reserve Propellants and Service Items		W7.0			(1,080)	(-20)	(1,060)	(-4)	(1,056)	(---)	(---)	(1,056)		
Service Items (Retro)		7.9			1,080	-20	1,060	-4	1,056	---	---	1,056		
S-IB/S-IVB Interstage at Ground Ignition		Wbg			(5,600)	(+456)	(6,056)	(-143)	(5,882)	(---)	(+31)	(5,913)		

SATURN IB/S-IVB INSTALLATION - STATION LIST



INSTALLATION	STATION	INSTALLATION	STATION
A. FWD. BULKHEAD (FWD. END)	684.6	I. ULLAGE ROCKET FAIRING (FWD. END)	255.6
B. FWD SKIRT (FWD. END)	676.7	J. COMMON BULKHEAD (AFT END)	244.9
C. TUNNEL (FWD. END)	607.7	K. TUNNEL (AFT END)	224.1
D. FWD. SKIRT (AFT END)	554.7	L. ATTITUDE CONTROL MODULE (AFT END)	205.1
E. FWD. BULKHEAD (AFT END)	553.0	M. ULLAGE ROCKET FAIRING (AFT END)	204.6
F. COLD HELIUM BOTTLES 8 BOTTLES @ 26.9" ON CENTERS	454.0	N. LH <sub>2</sub> FEED LINE FAIRING (AFT END)	202.7
G. COMMON BULKHEAD (FWD. END)	335.2	O. AFT SKIRT (AFT END)	200.6
H. LH <sub>2</sub> FEED LINE FAIRING (FWD. END)	295.1	P. INTERSTAGE (FWD. END)	200.6
I. AFT SKIRT (FWD END)	286.1	Q. TANGENT POINT THRUST STRUCTURE	186.7
J. ATTITUDE CONTROL MODULE (FWD. END)	285.5	R. AFT BULKHEAD (AFT END)	156.3
K. AFT BULKHEAD (FWD. END)	287.9	S. THRUST STRUCTURE (AFT END)	124.6
L. GIMBAL STATION		T. ENGINE NOZZLE (AFT END)	100.0
M. ENGINE NOZZLE (AFT END)		U. INTERSTAGE (AFT END)	-16.0
N. INTERSTAGE (AFT END)		V. INTERSTAGE (AFT END)	-23.9

FLIGHT SEQUENCING

Saturn IB/S-IVB	Weight (Pounds)	Center of Gravity (DAC Station - Inches)			Moment of Inertia (Kg-M-Sec <sup>2</sup> )		
		X	Y	Z	Pitch	Roll	
S-IVB Stage at Ground Ignition	245,721	277.2	-0.6	-0.1	76,700	7,410	
Service Items (Ullage)	-183						
Aft Frame - Jettison	-25						
Ablative Insul-Thermolag	-20						
S-IVB Stage at Ignition	245,493	277.2	-0.6	-0.1	76,700	7,360	
Fuel - Thrust Buildup	-165						
Oxidizer - Thrust Buildup	-320						
S-IVB Stage at Liftoff	245,008	277.0	-0.6	-0.1	76,200	7,360	
Ullage System	-223						
Fuel	-36,542						
Oxidizer	-182,708						
Service Items (Roll Control)	-39						
S-IVB Stage at Cutoff	25,496	318.9	-3.5	-1.4	27,500	7,730	
Fuel - Thrust Decay	-25						
Oxidizer - Thrust Decay	-75						
S-IVB Stage at End of Thrust Decay	25,396	319.4	-3.5	-1.4	27,400	7,730	
S-IVB Stage Dry Weight	23,071	326.4	-3.4	-1.6	25,600	7,570	

FLIGHT SEQUENCING

Saturn IB/S-IVB	Weight (Pounds)	Center of Gravity (DAC Station - Inches)			Moment of Inertia (Kg-M-Sec <sup>2</sup> )		
		X	Y	Z	Pitch	Roll	
S-IB/S-IVB Interstage at Ground Ignition	5,913	55.7	-1.0	-0.3	1,700		2,950
Service Items	1,056						
S-IB/S-IVB Interstage at End of Thrust Decay	4,857	57.6	-1.2	-0.3	1,390		2,420

ITEM	CHANGE BETWEEN LAST & CURRENT STATUS REPORTS	REASONS FOR DIFFERENCES  <u>MSFC RESPONSIBILITY CHANGES</u> (Saturn IB/S-IVB)
Structure	W3.0 (-185)	
Thrust Structure	3.9 -185	As a result of a request from Mr. Roy E. Godfrey, S-IVB Stage Manager, (Reference: letter number I-V-S-IVB-64-A9, dated March 17, 1964) the estimated weight effect of unapproved Scope Change 1071, Redesign of Thrust Structure (+185 pounds added per SM-44177, dated August 15, 1963), is allocated to "Contractor Responsibility Changes" (-185 pounds). At such time as the scope change becomes contractual the weight effect will be reallocated to "MSFC Responsibility Changes".
Equipment & Instrumentation	W6.0 (-295)	
Telemetry & Measuring Equip.	6.8 -295	Allocation of estimated weight effect of unapproved Scope Change 1033A, Leak Detection, (+295 pounds added per SM-44763, dated October 15, 1963), to "Contractor Responsibility Changes" for the reason as stated in 3.9 above (-295 pounds).

ITEM	CHANGE BETWEEN LAST & CURRENT STATUS REPORTS	REASONS FOR DIFFERENCES	CONTRACTOR RESPONSIBILITY CHANGES (Saturn IB/S-IVB)
Structure	W3.0 (+220)		
Aft of Tanks	3.8 +35	The weight for the Aft Skirt is revised to reflect the following design revisions released on production drawing changes:	
		Doublers and splices added to remove the possibility of the LOX Dome bearing against rivet heads (+2 pounds); splicing of the skin for ease of manufacture (+13 pounds); incorporation of production drawing revisions which reflect the installation of the Torque Box required where the LH <sub>2</sub> feed line passes through the skirt (+20 pounds).	
Thrust Structure	3.9 +185	Allocation of estimated weight effect of unapproved Scope Change 1071, Redesign of Thrust Structure, from "MSFC Responsibility Changes" (+185 pounds). See Thrust Structure - "MSFC Responsibility Changes".	
Propulsion Sys. & Accessories	W4.0 (+6)		
Engine & Accessories	4.1 +6	The weight for controls is revised to reflect an increase in tube lengths due to minor rerouting from the customer connect panel to the umbilical (+2 pounds) and a correction on the calculation for flex hoses used in tube assemblies (+4 pounds).	
Purge System for Chilldown	4.6 +1	Miscellaneous weight changes (+1 pound).	
Fuel System	4.7 -3	The pressurization system is revised to reflect a vendor actual weight for pressure switches (-4 pounds).	
Oxidizer System	4.8 +2	Miscellaneous weight changes (+1 pound). The tank pressurization system is revised to reflect miscellaneous production drawing changes (+6 pounds) and a vendor actual weight for pressure switches (-4 pounds).	

ITEM	CHANGE BETWEEN LAST & CURRENT STATUS REPORTS	REASONS FOR DIFFERENCES	CONTRACTOR RESPONSIBILITY CHANGES (Saturn IB/S-IVB)
Equipment & Instrumentation W6.0	(+379)		
Structure (Equip. & Instr.) 6.1	+27	An allowance is added for module mounting panels on the thrust structure (+25 pounds).	
		Secondary structure is added to the aft skirt area to remove the possibility of the LOX Dome bearing against rivet heads (+2 pounds).	
Environmental Control Sys. 6.2	-28	Reallocation of panel attachments and accessories to Telemetry & Measuring Equip., W6.8, in accordance with the functional organization of MSFC-STD-204A (-28 pounds).	
Telemetry & Measuring Equip. 6.8	+335	Reallocation of panel attachments and accessories from Environmental Control System, W6.2, in accordance with the functional organization of MSFC-STD-204A (+28 pounds).	
		Incorporation of weight estimate revisions for the bus modules and the temperature bridge modules based upon first release production drawings on the S-IVB All Systems Vehicle (+12 pounds).	
		Allocation of estimated weight effect of unapproved Scope Change 1033A, Leak Detection, from "MSFC Responsibility Changes" (+295 pounds). See Thrust Structure - "MSFC Responsibility Changes".	
Electrical System 6.11	+10	The weight for batteries is revised to reflect the more realistic maximum specification weight (+10 pounds).	
Auxiliary Propulsion System 6.16	+13	The weight for mounting hardware is revised to include a first release production drawing on the bracket installation support, which anticipates the approval of Scope Change 1196, Revised Flight Stage Structural Loads, (+15 pounds).	
Ullage System 6.18	+22	Miscellaneous weight changes (-2 pounds). The Ullage System is revised to include an allowance (not carried previously) for Ullage Rocket Jettison controls (+22 pounds).	

ITEM	CHANGE BETWEEN LAST & CURRENT STATUS REPORTS	REASONS FOR DIFFERENCES	<u>CONTRACTOR RESPONSIBILITY CHANGES</u> (Saturn IB/S-IVB)
<u>S-IB/S-IVB Interstage</u>  Structure                    W3.0  Interstage                 3.13	(+31)  +31	<p>The interstage structure is revised to reflect the actual weights of numerous stringers (+23 pounds) and eight reaction beams (+54 pounds).</p> <p>The weight allowance, for that portion of the separation frame in the aft skirt which is jettisoned upon separation of the S-IVB Stage from the S-IB Stage, is removed to eliminate a weight duplication (-45 pounds).</p>	

APPENDIX I

AUTHORIZED SCOPE CHANGES INCORPORATED INTO THE SATURN S-IVB  
WEIGHT AND BALANCE STATUS REPORT

AUTHORIZED SCOPE CHANGES INCORPORATED INTO THE SATURN S-IVB  
WEIGHT AND BALANCE STATUS REPORT

SCOPE CHANGE	DESCRIPTION	<u>CHANGES TO ORIGINAL SPECIFICATION WEIGHT</u>			
		<u>S-IVB STAGE</u>		<u>AFT INTERSTAGE</u>	
		S-V/S-IVB	S-IB/S-IVB	S-II/S-IVB	S-IB/S-IVB
1001B	Telemetry System	+818	+823		
1011A	S-II Retro Rockets			*	
1016B	Deletion of S-IVB Retro Rockets	-110	-120		
1024	Turbo Pump Warm Helium Purge	+10	+10		
1027A	Recirculation Chillover and Prevalve Installation	+123	+123		
1040A	Vertical Engine Handling Kit	+15	+15		
1060	Extension of Aft Inter- stage			*	*
1075B	Propellant Tanks Redesign	+1,460	+910		
1096	Deletion of Heat Barriers	*	*		
1097	APS Propellant Capacity Redesign		+50		
1098	Aerodynamic Fairing - Aft Interstage				+450
1102	S-IB Retro Rockets				+26
1151	Increased Pressure for Stage Hydraulic System	+30	+30		
Total Weight		+2,346	+1,841		+476

\*Included in Original Specification Weight

APPENDIX II

AUTHORIZED CHANGES NOT INCORPORATED INTO THE BODY OF THE  
WEIGHT AND BALANCE STATUS REPORT

AUTHORIZED CHANGES NOT INCORPORATED INTO THE BODY OF THE  
WEIGHT AND BALANCE STATUS REPORT

CHANGES TO CURRENT WEIGHT STATUS

SCOPE CHANGE	DESCRIPTION	<u>S-IVB STAGE</u>		<u>AFT INTERSTAGE</u>	
		S-V/S-IVB	S-IB/S-IVB	S-II/S-IVB	S-IB/S-IVB
1027B*	Incorporation of Recirculation Type Chilldown & Prevalve Installation	+182	+177		
1045B*	Thermoconditioning System-Forward Skirt Electronics	+382	+382		
1104A	Design & Test Responsibilities for Umbilicals	+28	+28		
1152	Addition of Check Valve in GH <sub>2</sub> Bleed Line	+3	+3		
1153	Propellant Dispersion System	+54	+25	+16	+7
1176	Implementation of MSFC Spec. 143, Amendment 1	-20	-10		
1185	Plug Supervision Circuits	+1	+1		
1187	Provisions for Control Accelerometers and Rate Gyro	+30	+30		
1189*	Additional Coast Period Requirements	+73	+262		
1193	Revised Stage LOX Tank Vent Line	+5	+5		
1196*	Revised Flight Stage Structural Loads		+385		+700
1203	RPM Measurement on Engine LOX and LH <sub>2</sub> Turbo Pumps	+2	+2		
1205	Additional Electrical Separation Connectors			+5	+5
1207	Modification of Propellant Utili- zation System	+5	+5		
1219*	APS Control Relay Package	-7	-7		
<hr/> Total Authorized Changes not Incorporated into Body of Report		738	1,288	21	712
Stage Dry Weight per this Report		26,955	23,071	6,318	4,857
<hr/> Stage Dry Weight as Revised by all Authorized Changes		27,693	24,359	6,339	5,569

Partially Incorporated into Current Weight Status.

APPENDIX III

PENDING CHANGES TO SPECIFICATION WEIGHT

PENDING CHANGES TO SPECIFICATION WEIGHT

SCOPE CHANGE	DESCRIPTION	<u>*ROM WEIGHT EFFECT</u>			
		<u>S-IVB STAGE</u>		<u>AFT INTERSTAGE</u>	
		S-V/S-IVB	S-IB/S-IVB	S-II/S-IVB	S-IB/S-IVB
1033B	Leak Detection	113	97		
1071	Redesign Thrust Structure	185	185		
1099	APS Prop. Meas. Device	4			
1122	Common Booster Elec. Separation Conn.	1	1		
1124	Closed Circuit Chk. Command RF System	5	5		
1147	Redesign of Aft Interstage			-438	
1167	Stg. Prov. for J-2 Press. Switches	6	6		
1175	APS 150 Lb. Thrust Ullage Engine	18			
1184	Airborne TV Stg. Separation	135	135		
1192	Hydrogen Pressurant Heating	30	30		
Total Weight		497	459	-438	
Estimated Effect upon Current Weight		199	177	-438	

\*(ROM - Rough Order of Magnitude)



MISSILE & SPACE SYSTEMS DIVISION  
DOUGLAS AIRCRAFT COMPANY, INC.  
SANTA MONICA, CALIFORNIA